Institute *of* **Physics**

Bulletin of
The Environmental Physics Group

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Contents.

Editorial

We would like to welcome you to the first edition of the Bulletin this year. We start the year with a bumper issue of the Bulletin and I would like to thank all those who have sent in their articles for inclusion in this edition. In addition to the providing you with details of our next AGM this issue contains a research article on atmospheric pollution modelling and a personal account from Professor John Monteith who asks the question 'What is Environmental Physics?'. If you wish to respond to John's arguments - perhaps you agree with him or perhaps you disagree - then why not drop us a line. As usual we have a our items on meetings, funding sources, books and reports and the latest news and information.

Again we would like to remind you to send us your research articles, personal views or any relevant issues that you wish to highlight through the Bulletin. The EPG will be organising an eventful year of meetings and visits and other activities suggested by the membership throughout this year. If there are any particular activities that you would like to see organised then please let us know. Finally we all would like to wish you a happy and peaceful new year. Don't forget that the Bulletin is also available on the WorldWide Web, at the following URL:

`http://www.nerc-essc.ac.uk/~dwcp/Htmls/epg_top.html` .

Ranjeet Sokhi, David Pearson (editors).

The views expressed in this editorial are those of the editors, and do not necessarily reflect those of the Institute of Physics or of the Environmental Physics Group.

Annual General Meeting of the Environmental Physics Group, Wednesday 26 March 1997: University of Leeds

The sixth Annual General Meeting of the Environmental Physics Group will be held at the University of Leeds on: Wednesday 26 March 1997 during the conference *Measuring the Environment*, the Group's contribution to the Institute of Physics Annual Congress* (see also *Meetings, Conferences, Events*). The AGM will start at 10:10. Nominations for Group Officers (Chairperson. Vice-Chairperson and Honorary Secretary) should be sent to the Honorary Secretary not later than seven days before the AGM. Nominations must be proposed by not less than two Members of the Group and should be accompanied by the written consent of the nominee. Any member wishing to bring forward business of a character suitable for consideration at the AGM should inform the Honorary Secretary at least four weeks before the meeting.

Alastair McCartney (Honorary Secretary), Crop and Disease Management, IACR-Rothamsted Harpenden, Herts., AL5 2JQ

*For further information on the Physics Congress contact Catherine Ashworth at IOP, 76 Portland Place, London W1N 4AA, Tel 0171 470 4800; fax 0171 470 4848.

Research Notes

Modelling of Transfer and Deposition of Sulphur and Nitrogen Oxides Emissions from all Sources of Pollution in The United Kingdom.

Elena Klimova-Murphy
School of Environmental Sciences, The University of Greenwich, Deptford Campus, Rachel McMillan Building, Creek Road, London SE8 3BW, UK.

ABSTRACT

The air pollution transport model called UGEM (University of Greenwich Evaluation Model) has been developed to evaluate medium-range transport and deposition of sulphur (S) and oxidised nitrogen (N) emissions from all sources of pollution in the UK and their average annual depositions and concentrations throughout the UK. It allows the estimation of the level of pollution at a receptor from any particular source or from all sources of pollution in the UK. The model has been tested for its predictions against the available measurements. The results of the model performance are described in this paper.

INTRODUCTION

Models of the long range transport of air pollutants play an increasingly important role in developing our understanding of the processes of interaction between pollutants, their transport and deposition. They are also important in assessing the present day pollution climate and in contributing to policy formulation (RGAR, 1996). The UK-scale air pollution transport model called UGEM has been developed at the University of Greenwich, UK. An application of the model for the assessment of air quality on a local scale is studied. Such an application can only be possible if the model has a good prediction power for each small urban and rural site on a scale of 10 x 10 km^2 or 20 x 20 km^2.

DESCRIPTION OF THE UGEM MODEL

UGEM is a receptor orientated Lagrangian type model which yields annual average concentrations and depositions of S and oxidised N across the UK. UGEM employs a constant wind speed and a single wind rose with straight line trajectories. The model time step is 10 minutes. The boundary layer height is constant at 800 m, but there is a parameter of atmospheric stratification. Statistical data of rainfall over the 20 x 20 km grid are used in calculating wet deposition. The model has been described in some detail in Klimova-Murphy

and Fisher (1996). The model covers the UK with a 10 x 10 km^2 and/or 20 x 20 km^2 grid for emissions, atmospheric processes and depositions. The time step and grid size may be changed easily in the model. The model employs only UK emissions, with the sources in each square considered as an effective point source in the centre of that square. Instantaneous mixing through the air parcel is assumed and source height is not taken into consideration. There is no background element. All NOx is assumed to be emitted as NO_2. Single dry deposition velocities are used except for SO_2 where values are land use dependent. A fraction of emissions are assumed to dry deposit directly within the emitting grid square, the magnitude of this fraction has been chosen to achieve the best agreement with observations in the UK. Wet removal is through wet scavenging ratios based on constant drizzle. There is no representation of orographic enhancement.

The UGEM model has been developed as an "easy-to-adapt" mathematical model with the necessary minimum number of the input parameters and a basic chemical scheme. All of the input parameters, a chemical scheme, time step, grid size and all other parameters can be changed very easily in the model according to the model's application. The particular features of the modelling approach, used in UGEM, consist of the possibility of using variable sizes of grid square, which depend on the scale of investigated region; the use of variable time step resolution, which define the precision of the output results; the use of some elements of a GIS-approach for the analysis of input data and mapping of obtained results. It is easy to apply spatially varying conditions to parameters in the model, such as rainfall or deposition velocity, ensuring at the same time that flux is conserved. The UGEM model is implemented as a program package for IBM-compatible computers. Turbo C++ is used as the programming language.

THE UGEM MODEL PERFORMANCE

A regression analysis has been used to evaluate model performance for predicting spatially distributed concentrations and deposition. It was based on a comparison between measurements and modelling data of the annual average concentrations and wet deposition. Measurements have been obtained from the AEA (Atomic Energy Authority) National Environmental Technology Centre. Thirty two monitoring sites in rural areas measuring of sulphur and nitrogen pollution in the UK have been used for the model's validation. Modelled and measured annual average concentrations of SO_2 and NO_2 in rural areas for 1992 have been compared.

A comparison of the UGEM model predictions of sulphur and nitrogen pollution with the measurements have been performed and the results of the regression analysis are grouped together in Table 1.

Table 1 shows that the correlation coefficients of calculated and observed data for sulphur concentrations, sulphur wet deposition, nitrogen concentrations and nitrogen wet deposition exceed a value of 0.66, which shows that the model has good predictive power for these characteristics.

Correlation is perhaps better than expected in a similar model which does not take account of the formation of NO to NO_2 in any detail. The correlation coefficients of wet deposition of pollutants are lower than those for airborne concentrations. Hence the model predicts the airborne concentration slightly better than the wet deposition of acid species.

Better correlation of the observed and calculated data for concentrations compared to wet deposition might be due to the following reasons. First of all, it is considered that concentration is the best parameter for evaluating a medium-range transport model of air pollution. The concentrations can show better the pollution over the territory of the UK from indigenous sources of pollution because of the size of the investigated area. Wet deposition usually contains a considerable amount of long-range transported pollutants coming from the outside of the country and hence is less appropriate for modelling on the country-range or local-range level.

Table 1. Comparison of UGEM outputs with the measurements.

Characteristic	Units	Regression equation	Regression equation	Correlation coefficient
SO_2 concentrations	$\mu g\ SO_2\ m^{-3}$	$C_2 = 2.1 + 1.2\ C_1$	$C_1 = 0.5 + 0.6\ C_2$	0.87
Sulphur wet deposition	$mg\ S\ m^{-2}\ yr.^{-1}$	$C_2 = -140 + 1.5\ C_1$	$C_1 = 469 + 0.3\ C_2$	0.66
NO_2 concentrations	$\mu g\ NO_2\ m^{-3}$	$C_2 = -0.02 + 0.7\ C_1$	$C_2 = 1.8 + 0.97\ C_1$	0.83
Nitrogen wet deposition	$mg\ N\ m^{-2}\ yr.^{-1}$	$C_2 = 50 + 0.6\ C_1$	$C_2 = 138 + 0.8\ C_1$	0.72

where C_2 = calculated data, and C_1 = observed data.

On the basis of the results and the correlation coefficients in particular, it might be possible to conclude that the UGEM model works well and hence can be used for the predictions of sulphur and nitrogen concentrations in the UK.

REFERENCES

E. Klimova-Murphy and B. E. A. Fisher, (1996)
Application of a long-range transport model for the assessment of air quality on a local scale, Proceedings of the 4th Workshop on Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes, VITO, May 1996, Belgium.

Report of the Review Group on Acid Rain, (1996), to be published.

Personal Views

What is environmental physics?

John L. MONTEITH
Institute of Terrestrial Ecology, Edinburgh, Research Station, Bush Estate, Penicuik, Midlothian, EH26 0QB

This article is based on the plenary lecture given by Professor Monteith at last years IOP Congress 1996.

What is Environmental Physics? There is no "correct" answer to this question but it is not hard to find imperfect answers! Some time ago, the Environmental Physics Group of the Institute of Physics produced a leaflet in which the subject was defined as follows:

"Environmental Physics is the application of the principles of physics to environmental processes and problems." That is true, but somewhat too broad. The statement goes on: "It is concerned with the atmosphere, the oceans, the earth's crust and the biosphere." That is also true up to a point - but does this mean that Environmental Physics encompasses the whole of meteorology, oceanography and geophysics? The answer must be "no" because these subjects include major elements of mathematics, chemistry and biology as well as physics.

About 25 years ago I wrote a book that I called "Principles of Environmental Physics" and on page 2 I defined the subject as "the measurement and analysis of **interactions** between organisms and their physical environment". I stressed that "interaction is the key word in the definition" - and I still believe that is the heart of the matter. One of the major challenges of Environmental Physics is to find rigorous quantitative ways of describing two complementary sets of processes: the response of organisms to their physical environment; and the response of physical environments to the presence of organisms. Environmental Chemistry can be defined in a similar way though, in practice, the chemical impact of a pollutant on an organism is usually much stronger than the converse process. Environmental Biology **should** contain elements of both Environmental Physics and Environmental Chemistry but is almost invariably taught by biologists whose background in the physical sciences is not very strong.

Environmental Physics and Chemistry are therefore interdisciplinary subjects that can help school pupils and university students to appreciate the strength and utility of links between disciplinary components of science courses. It is possible to trace the evolution of these subjects, in Britain at least, by looking at their history in the UCCA Handbook over the past 25 years. The biologists were first to grasp the importance and attraction to sixth-formers of the environmental sciences and ecology courses have been on offer for many years. (So, of course, have environmental studies in geography departments but their bias has usually been sociological rather than physical or biological). In the 70's, as problems of pollution became prominent both nationally and globally,

courses in environmental chemistry began to appear. I am afraid Environmental Physics was never anywhere near Top of the Pops as far as British universities are concerned but for over 20 years Nottingham University had an Environmental Physics section within a Department of Physiology and Environmental Science - a component of the Faculty of Agricultural Science. During the time that I held the Chair of Environmental Physics, I never discovered another either in the UK or abroad. The subject never attracted many *undergraduates* but a steady supply of very able *postgraduates* and *postdoctoral* workers, supported by funds from three research councils and two Government Departments, enabled the group to survive and flourish. Elsewhere, Strathclyde was the only British University I was aware of where Environmental Physics was taught in a Physics Department, thanks to the vision and enthusiasm of the late Edward Eisner.

In the 1970's and 80's, the Agricultural Research Council, the Medical Research Council and the Natural Environment Research Council all supported viable groups of environmental physicists within their own institutions and through grants to university departments. The scope of university involvement can be judged by the fact that, during this period, I was invited to speak at every university in the United Kingdom! In the 1990's however, funding cuts seem to have damaged Environmental Physics more than other subjects, at least in part because contemporary enthusiasms like "biotechnology" have shifted resources from organisms to cells. Rothamsted Experimental Station - where Howard Penman's work on evaporation laid the foundations for growth of Environmental Physics in Britain - closed its famous Physics Department some years ago. The main agricultural centre of Environmental Physics is now at Silsoe Research Institute, formerly the National Institute of Agricultural Engineering, where the Director, Brian Legg, is a physicist who keeps the Rothamsted tradition alive. There is also a small group of physicists at the Scottish Crops Research Institute working generally on the response of crops to their physical environment and specifically on the structure and functioning of root systems which are exceedingly hard to study *in-situ*.

Within the Natural Environment Research Council system, the recently formed Centre for Ecology and Hydrology employs environmental physicists at two major Institutes. The Institute of Hydrology is concerned with the physics of the hydrological cycle on a very wide range of scales from field to continent. The Institute of Terrestrial Ecology supports work on the transport of pollutants in air, soil and water, on remote sensing, and on the impact of climate change on ecosystems.

In the next millennium, it seems likely that climate change will play an increasingly prominent role both in the media (where every climatic anomaly will be treated as sensational) and in programmes of environmental research where objective measurement, analysis and prediction will demand painstaking effort by environmental scientists, physicists included. It is surely time for the Institute of Physics to play a more conspicuous role in encouraging the national growth of Environmental Physics, redefined as the measurement of interactions between organisms **and an environment that is slowly but inexorably changing**.

Official Launch of the Staffordshire's Local Agenda 21

Colin McCarthy
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I have been working voluntarily with Staffordshire County Council Environmental Forum and Action Groups for four years now and I think the EPG may be interested in the results as it is important to UK competitiveness. There are also implicit moral issues included in Staffordshire's Local Agenda 21. An action plan for sustainable development in Staffordshire was launched on the 1 July 1996 from Shire Hall, Stafford and handed to over 40 organisations across Staffordshire. The action plan, co-ordinated by Staffordshire County Council, had been produced over the last three years by organisations from all over Staffordshire ranging from large organisations such as GEC and the Environment Agency to Small and Medium Sized Companies and special interest groups such as the World Wildlife Fund. The Institute of Physics was represented by Colin McCarthy, Industry Representative of the Midland Branch of the Institute of Physics. Agenda 21 is an action plan for sustainable development that originated in the United Nations Conference on Environment and Development that took place in Rio de Janeiro in June 1992 and was one of the four main agreements signed by over 150 countries.

Local Agenda 21 is an action plan aimed at local communities with the objective of achieving sustainable development. It aims are to promote the concept of shared responsibility in ensuring the most efficient use of resources and reducing the damage to the environment and also to peoples health caused by unnecessary pollution. These issues are important to physics based companies as there is a vast market for e.g. pollution monitoring and control equipment as well as more modern energy efficient manufacturing and transport systems. However, one of the biggest tasks remaining is to convince British Business of the competitive advantage that comes from involvement in Local Agenda 21 and to grasp the opportunities* that this initiative has provided for the British economy.

I have been working with County Planners and we have produced an action plan that reduced over 130 pages of report to seven key actions primarily transport based. These were presented to various sections of government and the response so far has been favourable.

* A report from the Environmental Industries Commission indicates that the Government's failure to strictly enforce its pollution control laws is costing British Environmental companies up to £2 billion a year.

The Institute of Physics Annual Congress, 1997 24-27 March 1997, University of Leeds

In addition to the Physics World '97 Exhibition the Congress programme includes 11 conferences organised by the various Groups of the Institute. The following conference has been organised by the EPG:

Measuring the Environment, 26 March

EPG organisers: J Garland (AEA Technology) and D H Peirson

Man's increasing pressure on his environment is much in the news. Assessment of this impact requires a wide range of environmental measurements. Presentations during this meeting will illustrate the diverse range of techniques of physics that are applied to measurement problems in the atmosphere, hydrosphere and the solid earth.

0900 Registration
0930 Measuring Precipitation with Weather Radar
A Illingworth (University of Reading)
1010 Coffee and the Annual General Meeting of the Environmental Physics Group
1040 Measurement of Atmospheric Heat and Momentum Fluxes by Optical Scintillation
V Thiermann (Scintec Gmbh)
1120 Progress and Prospects in the Estimation of Land-based Biophysical and Biochemical Properties using Satellite Remote Sensing
1200 The IOP Congress Plenary - Title to be announced
D Robinson (UKAEA)
1300 Lunch
1400 The Use of Airborne Remote Sensing to Improve the Environment
D Palmer (Environment Agency)
1440 Detection, Assessment and Control of Oil Pollution in the Marine Environment
R Stockham (Air Atlantique)
1520 Tea
1550 ElectroKinetic Imaging of Subsurface Fluids
M Underwood (GroundFlow Ltd)
1630 Discussion
1700 Close

For further information please contact the Conference Department, Institute of Physics, 76 Portland Place, London, W1N 4AA, UK.

Meetings, Conferences and Events

RSS97: Observations and Interactions

23rd Annual Conference & Exhibition of the Remote Sensing Society
The University of Reading, 2nd-4th September 1997

FIRST ANNOUNCEMENT AND CALL FOR PAPERS

A new generation of remote sensing systems now permits observation of environmental processes at a wide range of spatial and temporal resolutions, frequencies and viewing angles. These new ways of looking at the Earth have led to the development of more sophisticated energy-matter interaction models, improving our ability to make physical measurements of the land surface, oceans and atmosphere. We are now able to derive better datasets for a wide range of environmental studies, including energy, water and biogeochemical cycles, vegetation dynamics, sediment transport, pollution and geological processes. We now possess the ability to study the Earth system at a scale and in a degree of detail previously impossible.

ABSTRACTS: You are cordially invited to take part in the 23rd Annual Conference of the Remote Sensing Society. The provisional programme includes sessions on land surface processes, meteorology, coasts and oceans, geology and NERC science, but contributions are sought on all aspects of remote sensing. Authors should submit abstracts for oral or poster presentations at the meeting. Abstracts of no more than 300 words should be received by post, fax or email no later than **1st February 1997**. They should include name(s), affiliation(s), title and three key words. Please note that papers will only be provisionally accepted until receipt of registration fee.

VENUE: The University of Reading provides an excellent venue for the meeting, with easy access by both rail and motorway. London's Heathrow Airport is only 45 minutes away, and a frequent coach service is available. The conference will take place in the peaceful surroundings of Bulmershe campus, which offers a range of accommodation and ample parking immediately adjacent to the conference facilities. Other accommodation is available in and around Reading.

We look forward to seeing you at RSS97.

FURTHER INFORMATION:

Web page (URL is case sensitive): http://www.rdg.ac.uk./AcaDepts/sg/Geog/pages/rss97/rss97.html

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Reading RG6 6AB, UK

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Fax 01734 755865
email rss97@geography.reading.ac.uk

Environmental Risk Assessment and BPEO: Offshore Structures

Organised by the Environmental Physics Group of the IOP in collaboration with the Institution of Environmental Sciences.

This seminar will address the environmental risk associated with the decommissioning of offshore structures. The speakers will examine the established methodologies, their usefulness and how they may develop in the future. Key issues will include quantification of comparative options and the practical difficulty in developing a universally acceptable agreement of 'Best Practicable Environmental Option (BPEO)' by means of technical assessment alone.

Date and Time: 14.30-17.00 Thursday 20 February 1997
Venue: The Institute of Physics, 76 Portland Place, London W1
Registration fee: A £5.00 will be collected at the door

For further information contact:
Richard Clarke, Tel: 0113 231 2432

1997 Open Meeting of the Human Dimensions of Global Environmental Change Research Community

This will take place at the International Institute for Applied Systems Analysis in Laxenburg, Austria, 12–14 June 1997. Plenary sessions include *Attitudes and Behaviour in Global Change*, *Integrated Assessment*, *Health and Global Change*, *Business and Trade*, *Environmental Security*, *Governance*, and *Technological Change*.

Further information is available from
Ingrid Teply-Baubinder, IIASA, A-2361 Laxenburg, Austria.
Tel: +43-2236-807 Fax: +43-2236-71-313
Email: teply@iiasa.ac.at
http://www.iiasa.ac.at/ or http://www.ssrc.org/

Meeting: European Geophysical Society XXII General Assembly, 21–25 April 1997 at the Austria Centre, Vienna.

The scientific programme includes 150 sessions encompassing Solid Earth Geophysics, Hydrology, Oceans and Atmosphere, Solar-Terrestrial and Planetary & Solar System Sciences, Nonlinear Processes in Geophysics and Natural Hazards. The deadline for abstracts has passed (15 December 1996), but attendance is still open. For an attendance form contact

EGS Office, Max-Planck-Str. 1, 37191 Katlenburg-Lindau, Germany.
Tel: (49)-5556-1440 Fax: (49)-5556-4709
Email: egs@linax1.mpae.gwdg.de
Internet: http://www.mpae.gwdg.de/EGS/EGS.html
N.B. The 23rd General Assembly will be in Nice, France, 20–24 April 1998.

World Conference on the Role of Earth Observation Data in Forecasting, Managing and Recovering from Natural Disasters, Queen Elizabeth Conference Centre, London, 8–10 July 1997.

Speakers will be drawn from research communities researching natural disasters, information services, aid agencies and governmental agencies (from local to national) that deal with disaster relief. Commercial organisations that are directly affected by disasters, such as airlines, banks and insurance companies will also address the conference.

A key aspect of the event will be the direct participation of organisations covering humanitarian relief, commerce, and government agencies, providing insight into disaster management as aided by spaceborne instruments and contemporary disaster monitoring facilities. For more information and a registration form, contact: Dr. Dave Sloggett, Cray Systems, 5 Genesis Business Park, Albert Drive, Woking, Surrey, GU21 5RW.
Tel: +44 1483 740014 Fax: +44 1483 740231.

United Kingdom Geophysical Assembly, University of Southampton, 2–4 April 1997.

Contributions are welcome from all fields of geophysics to the following sessions:

- Archaeology and geophysics
- Environmental magnetism: paleoclimate, provenance, diagenesis, pollution
- Seismic contributions to geological hypotheses
- Extensional tectonics
- Gravity and geodesy
- Geomagnetism and paleomagnetism
- Exploration and earthquake seismology
- Marine geophysics
- Environmental geophysics
- Geothermics
- Tectonophysics
- Planetary studies
- Mineral physics
- Geophysical fluid dynamics
- Applied geophysics and electromagnetism
- Shelf-edge oceanography.

Deadline for abstracts and reduced registration fees: 20 January 1997.
Contact:
Jackie Ward, UKGA-21, University of Southampton, Department of Geology, Southampton Oceanography Centre, European Way, Southampton SO14 3ZH. Tel (01703) 595069, fax (01703) 593052, email: ukga@soc.soton.ac.uk,
internet http://www.soc.soton.ac.uk/GEO/ukga.html.

BRIDGE Meeting, 14–15 May 1997, Geological Society of London.

The two-day meeting will be titled *Modern ocean floor processes and the geological record.* It will be sponsored by BRIDGE, the Marine Studies Group of the Geological Society and the Challenger Society for Marine Science. Provisional sessions are:

- Crustal accretion at modern and ancient mid-ocean ridge systems
- Alteration of the oceanic crust and evaluation of hydrothermal fluxes
- Refining our understanding of ore formation
- Gene flow and site colonisation: evidence from modern systems and the geological record.

Contact: *Dr. Keith Harrison, BRIDGE Programme Manager, Department of Earth Sciences, University of Leeds, Leeds LS2 9JT. Tel (0113) 233 5241, fax (0113) 233 5259, email* bridge@earth.leeds.ac.uk .

Third ERS (European Remote Sensing Satellite) Scientific Symposium, 17–20 March 1997, Florence.

Contact: *G. Kohlhammer, c/o ESRIN. Tel: +39 6-94180 360, fax : +39 6-94180 362, email* jfyall@mail.esrin.esa.it .

4th International Conference on Remote Sensing for Marine and Coastal Environments: Technology and Applications, 17–19 March 1997, Orlando, Florida.

Contact: *ERIM Conferences, PO Box 134001, Ann Arbor, MI 48113-4001. Tel 1-313-994-1200 x3453, fax 1-313-994-5123, email:* raeder@erim.org,
internet http://www.erim.org/CONF/conf.html.

7th ISPRS Symposium on Physical Measurements and Signatures in Remote Sensing, 6–11 April 1997, Courchevel, France.

Contact: *Mme. C. Olague, 22 Avenue de Purpan, 31700 Blagnac, France. Tel 33-6171 5571, fax 33-6171 4437, email* olague@cta.worldnet.net

START/WCRP/SCOWAR Workshop on Climate Variability, Water and Agriculture in Sub-Saharan Africa: Food Security Issues, 17–19 February 1997, Cotonou, Bénin.

Contact: *Abel Afouda, fax +229 30 08 39.*

Climate Change Impact Assessment Workshop for Africa, 17–21 March, Cape Town, RSA.

Contact: *International START Secretariat, Suite 200, 2000 Florida Avenue NW, Washington, DC 20009, USA. Fax +1-202 457 5859, email* start@dis.start.org .

GCTE Soil Erosion Network Water Erosion at Catchment Scale Model Comparison and Sensitivity Analysis Workshop, 14–18 April 1997, Utrecht, Netherlands.

Contact: *Christian Valentin, ORSTOM, Institute Français de Recherche Scientifique pour le Développement en Coopération, BP 11416, Niamey, Niger. Fax +227 722 804.*

Technology Transfer '97, 13–15 May 1997, NEC Pavilion, Birmingham.

From the press release: 'This radical new concept is responding directly to the needs of all disciplines of British Industry. Sponsored by the DTI and CBI it will provide a unique forum, where visitors can establish just what resources and technological developments are available and from whom. It will help those seeking partners for innovation to assess the amount of time, money and manpower needed and also give access to expert advice. It will offer all industries the opportunity of sharing costs, risks and technical expertise through collaborative research and development. Form partnerships for the development of innovation and turn ideas into new products, creating new jobs and wealth for your company.'

The future's so bright, I gotta wear shades! To discuss stand availability, prices, attendance, etc., contact: *Heidi Hannant, Miller Freeman Exhibitions, on (0181) 302 8585 or fax (0181) 302 7205.*

SASCOM/IGAC Workshop on Aerosol, Biomass Burning and Acid Rain, September/October 1997, Reduit, Mauritius.

Contact: *A.P. Mitra, SASCOM, National Physical Laboratory, Hillside Road, New Delhi 110 112, India. Fax +91-11 575 2678, email* apmitra@doe.ernet.in .

Research Funding News

The Royal Academy of Engineering's Engineering Foresight Awards

These provide support to enable engineers engaged in UK R&D activities, in areas highlighted by the Technology Foresight programme, to be seconded to centres of excellence overseas. Host organisations will be those who are leading the development of new or enhanced technology. The aim of the scheme is to support the further international development of Technology Foresight networks and thereby encourage the uptake of globally competitive technology in the UK.

Secondments will normally be for periods of six to twelve months, with awards providing for up to 50% of total agreed costs. Applications are welcomed form most sectors of the UK R&D community.

Contact: *Alison Bowen, Manager, Engineering Foresight Awards, The Royal Academy of Engineering, 29 Great Peter Street, Westminster, London, SW1P 3LW. Tel (0171) 222 2688, fax (0171) 233 0054.*

EDGE: Ecological Dynamics and Genes.

NERC is going to provide £3.4 million to fund research into the dynamics of genes in populations, under a program to be known as EDGE. New molecular and genetic techniques are to be exploited to solve previously intractable problems in the dynamics of ecological processes. EDGE will study the responses of organisms to environmental change at several levels – individual, community and population. A theme will be the potential impact of the release of genetically modified organisms into the environment.

For further information contact *Dr. Rosemary Hails, IVEM, Mansfield Road, Oxford, OX1 3SR. Tel (01865) 512361.*

South Africa/UK Science and Technology Research Fund.

See also EU Communiqué E59:96, or DTI press release P/96/822, 4/11/96.

The Research Fund aims to foster closer scientific links and support projects of scientific excellence. Research proposals should be developed to subvent existing research programmes being supported from normal funding available in the respective countries in the subject areas: biomedicine; agriculture and biotechnology; environmental protection and utilisation of natural resources. Funding may be up to £10,000 *per annum* for up to 2 years. Further information and application forms are available from *Doug Power, Office of Science and Technology, Albany House, Petty France, London SW1H 9ST. Tel (0171) 271 2149, fax (0171) 271 2143, internet* `http://www.open.gov.uk/ost/osthome.htm`.

The deadline for submissions is 31/3/97 at Cape Town.

Finance From Europe: a Guide to Grants and Loans from the European Union.

This useful guide is available from *The European Commission, 8 Storey's Gate, London SW1P 3AT. Tel (0171) 973 1992, fax (0171) 973 1910/1900, telex 23208 EURUK G.*

The Framework IV Programme – Terminology.

It's all very confusing – but maybe this article will help. It is quoted from *Europe: Funding from the Fourth Framework Programme for Research and Technological Development (1994–1998)*, which is available free from *Europe-Funding R&TD Booklet, PO Box 849, Basildon, Essex, SS14 3FE.*

Methods of Funding.

The bulk of the funding from FP4 will take the form of "shared cost actions", "direct actions" and "concerted actions". In addition, funds may be applied to "specific measures" and "preparatory, accompanying and support measures". Each of these is described below.

Shared cost actions.

"Shared cost actions" include:

- **research and technological development projects** carried out by companies, research centres and universities. Grants of up to 50% of eligible project costs may be made. In addition, research centres, including universities, may receive a contribution of up to 100% of the marginal costs of carrying out the research together with a contribution (up to 20%) of overhead costs;
- **technology stimulation.** This aims to encourage SMEs to participate in various programmes. Grants of 100% for the exploratory phase of a project, for example in finding partners, may be made to qualifying SMEs.
- **demonstration projects** jointly financed by the private and public (local authority, development agency) sectors. The Community will contribute up to 40% of eligible costs. The percentage is progressively lower for projects closer to the market.
- support for financing the **infrastructure or installations** necessary for collaborative research.

Concerted Action

"Concerted actions" are activities which are intended to stimulate or improve the co-ordination of individual projects carried out in member states. They do not cover direct funding of the research itself.

The term "Concerted actions" includes:

- activities to co-ordinate, particularly with help of networks, the inputs and outputs of existing RTD projects;
- the co-ordination of networks of researchers, manufacturers and users with common technological or industrial interests to participate in collaborations which can be funded as "shared cost actions".

Direct Action.

"Direct action" encompasses the Community's payment of ECU 900 million for the full cost of the institutional research and support activities undertaken directly by the Joint research Centre (JRC). The institutes of the JRC may, in addition, undertake commissioned research and may compete for funding, in collaboration with others, under other programmes of FP4. In addition the Community funds the full cost of the research undertaken by the JET facility at Culham.

Specific measures.

"Specific measures" are projects which aim to undertake scientific and technical research of direct relevance to the development or application of Community policies and standards. The setting up of scientific networks qualifies as a specific measure. The Commission will select researchers for commissioned research usually from existing networks on the basis of their expertise and their availability at the time required. The community may fund up to 100% of the work it commissions under this heading.

Preparatory, accompanying and support measures.

"Preparatory, accompanying and support measures" include technology transfer projects (particularly involving SMEs), studies in support if the management and evaluation of

the Community's current and future R&D programmes and the assessment in conjunction with the targeted socio-economic research programme, of the socio-economic impact and technological risk of projects seeking or receiving funding within the framework programme. These activities will be complementary to those carried out under the Third Activity of FP4 (dissemination and exploitation of results). The Community will pay 100% of costs.

NERC URGENT Programme - Call for Expressions of Interest

ETSU, Harwell, have been appointed Programme Managers for this research programme on Urban Regeneration and the Environment. The programme will encourage consortia including local community interest with small manufacturing enterprises and local authorities.

Full details can be obtained from:

Dr Chris J Franklin, URGENT Programme Manager (Tel: 01235 433591, Fax: 01235 433981, Email: chris.franklin@aeat.co.uk) or Dr Sandy J Muirhead, URGENT Programme Coordinator (Tel: 01235 433395, Fax: 01235 433453, Email: sandy.muirhead@aeat.co.uk)
ETSU, AEA Technology, B156 Harwell, Didcot, Oxfordshire, OX11 0RA

Books, Reports and Publications

International Directory of Global Environmental Research: Initiatives, Programmes and Organisations (Version 5).

From the Foreword: "Through summaries of the key programmes, organisations and agencies, the directory provides some insights into the international effort and activities relevant to global environmental research."

To find out how to get a paper version contact:
UK GER Office, DP 1002, Polaris House, North Star Avenue, Swindon, SN2 1EU.
Tel: (01793) 411734/68/79 Fax: (01793) 444513
Email: ukgeroff@wpo.nerc.ac.uk
or see http://www.nerc.ac.uk/ukgeroff/welcome.htm

Global Environmental Change Programme Briefings.

Briefings are published by the Economic and Social Research Council's Global Environmental Change Programme. This ten-year research programme was established in 1991 to bring social science and economics expertise to bear on global environmental research.

Briefings are a collaborative venture between researchers and the Global Environmental Change Programme Office. They address topics which one or more research projects or events within the Global Environmental Change Programme have identified as being of particular importance. For further information, contact Alister Scott at:

Global Environmental Change Programme, Mantell Building, University of Sussex, Brighton, BN1 9RF.
Tel: (01273) 678935 Fax: (01273) 604483.
Email: gec@sussex.ac.uk
Internet http://www.sussex.ac.uk/Units/gec/

Recent Briefings include *Using Environmental Impact Assessments in the Planning process*, and *Effectiveness of Legal Agreements to Protect Global Commons.*

Report: UK National Strategy for Global Environmental Research.

Produced by the Inter-Agency Committee on Global Environmental Change Expert Panel and is available from:

GER Office, Polaris House, North Star Avenue, Swindon, SN2 1EU.
Tel: (01793) 411779 Fax: (01793) 444513
Email: ukgeroff@wpo.nerc.ac.uk

Newsletter: GEC–O

This is the newsletter of the Economic and Social Research Council Global Environmental Change Programme. It has a circulation of about 4000 environmental researchers, business people and policy makers, bringing news on events, networks and research. To get on the mailing list or make a submission, contact Alister Scott, Global Environmental Change Programme, Mantell Building, University of Sussex, Brighton, BN1 9RF. Tel: (01273) 678935, fax: (01273) 604483. Email: gec@sussex.ac.uk,
internet http://www.sussex.ac.uk/Units/gec/ .

SCAR Bulletin, the Bulletin of the Scientific Committee on Antarctic Research.

This is a quarterly publication carrying reports of SCAR meetings, notes, reviews and articles and material from Antarctic Treaty Consultative Meetings suitable for a wide readership. For information on subscription, contact
The Editor,
SCAR Bulletin,
Scott Polar Research Institute,
Lensfield Road,
Cambridge,
CB2 1ER.
Tel: (0223) 336567.

A related journal is the Quarterly **Polar Record**, containing articles, notes and reviews of contemporary or historic interest covering the natural and social sciences and humanities in polar and sub-polar regions, as well as adverts for new books, events of polar interest, etc. For submission, contact the editor at the SPRI (address above), for subscription contact
Cambridge University Press,
Edinburgh Building,
Shaftesbury Road,
Cambridge,
CB2 2RU.
1 year costs £44 for individuals, £72 for institutes, and single issues are £20.

Publication: *Britain's Place in Space.*

This is the British National Space Centre's unique reference of all those in the UK who undertake industrial and educational activities in space. Available on paper, floppy or CD-ROM. Contact *BNSC Information Unit, Bridge Place, London SW1V 1PT. Tel (0171) 215 0806/7/8, fax (0171) 215 0936,*
email `information@bnsc-hq.ccmail.compuserve.com.`

Department of Environment Publications.

Stratospheric Ozone 1996 - United Kingdom Stratospheric Ozone Review Group
The Potential Effects of Ozone Depletion in the United Kingdom
The United Kingdom National Environmental Health Action Plan: Overview
The United Kingdom National Air Quality Strategy: Consultation Draft

Available from: The Department of the Environment, Publications Despatch Centre, Blackhorse Road, London, SE99 6TT, UK

Environment Agency, UK: First Corporate Plan.

Available from: The Environment Agency, Head Office, Rio House, Waterside Drive, Aztec West, Almondsbury, Bristol BS12 4UD, UK
European Commission: Taking European Environment Policy into the 21st Century - A summary of the European Commission's Progress Report and Action Plan on the Fifth Programme of Policy and Action in Relation to the Environment and Sustainable Development.

Available from: Documentation Centre, Information and Communication, European Commission, DG XI, rue de la Loi 200, B-1049 Belgium.

Internal reports from the Joint Centre for Mesoscale Meteorlogy, University of Reading, UK.

A complete list is available from: Joint Centre for Mesoscale Meteorology, Harry Pitt, Building, University of Reading, Whiteknights Road, P O Box 240, Reading, RG6 6FN, UK

News and Information

G7 Environment and Natural Resources Management Project (ENRM).

This is one of 11 themes that form the G7 group of nations' Information Society Project.

The objective of ENRM is to make existing global information about the Earth and its ecosystems more widely available. Current activities of the ENRM organisations focus on meta-information, biodiversity and climate change. For each of these key areas there is a working group that proposes standards and suitable data sources for inclusion in the project.

The practical outcome of ENRM will be a library of environmental data and information. This will allow users to search remotely databases held separately at the locations of the participating organisations and see all the collections as though they were in one location. More information and a prototype library can be found at the Centre for Earth Observation's ENRM server at `http://enrm.ceo.org/` .

The success of ENRM depends on collaboration, and relies on information submitted by individuals and organisations. As an individual, you can contribute by registering with the ENRM directory of environmental professionals at `http://enrm.ceo.org/` .

Any organisation interested in contributing environmental datasets, technical expertise or consultancy to the ENRM project is invited to contact the coordinator: Larry Enomoto, NOAA/NESDIS, E/IA2, FB4, Room 0110, Washington, DC 20233, USA. Tel +1 301-457-5214, fax +1 301-736-5828, email `lenomoto@nesdis.noaa.gov` .

PEL version 2.0 Free!

Physics Express Letters (PEL) can be obtained free from IOP Publishing. PEL covers most areas of physics research and allows quick access to letters that will be published in the IOP Publishing journals.

For more information on PEL contact IOPP, Techno House, Redcliffe Way, Bristol BS1 6NX, England. Tel: +44 (0)117 929 7481, Fax: +44 (0)117 929 4318, Email: custserv@ioppublishing.co.uk, Internet: http://www.iop.org

Meteorological Office Network of Ocean Buoys

The network of 10 buoys has now been completed with each buoy making hourly measurements of various hydrodynamic parameters. The MO are welcoming suggestions from scientists on how the network can be fully exploited. For further information contact:

Bob Shearman, The Meteorological Office, Beufort Park, Easthampstead, Wokingham, Berks, RG40 3DN, UK. Tel: +44 (0)1344 855 600, Fax: +44 (0) 1344 855 897, Email: rjshearman@meto.govt.uk

Internet Sites of Interest

RSS97: Observations and Interactions.
http://www.rdg.ac.uk/AcaDepts/sg/Geog/pages/rss97/rss97.html

Paul Mather's GIS, Geography, Remote Sensing, Climate, etc. list.
http://www.geog.nottingham.ac.uk/~mather/useful_links.html

The Department of the Environment.
http://www.open.gov.uk/doe/epsim

EUREKA! Promoting market-oriented R&D across Europe.
http://eureka.belspo.be/

The Environmental Change Network.
http://www.nmw.ac.uk/ecn/

European Science Foundation
http://www.esf.org/

The Committee of the EPG.

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Dr. Peter Hodgson	Institute of Hydrology, Crowmarsh Gifford, Wallingford, OX10 8BB. Tel: (01491) 692275, Fax: (01491) 692424, Email: p.hodgson@ua.nwl.ac.uk .
Mr. Peter Hughes	Kingsway College, Grays Inn Centre, Sidmouth Street, London, WC1H 8JB. Tel: (0171) 306 5700, fax: (0171) 306 5800.
Dr. Neil Roberts	Magnetic Resonance Research Centre, University of Liverpool, Liverpool, L69 3BX. Tel: (0151) 7945629, fax: (0151) 7945635.
Ms. Alexandra Wilson	Research and Development, Ove Arup & Partners, 13 Fitzroy Street, London, W1P 6BQ. Tel: (0171) 4653045, fax: (0171) 4653669, email: alexandra.wilson@arup.com .
Prof. Edward Youngs	9 Roundwood Park, Harpenden, Herts. AL5 3AB. Tel: (01582) 460859 or (01525) 863330, fax: (01525) 863001, email: e.g.youngs@cranfield.ac.uk .